HEARING CONSERVATION PROGRAM

THE AUDIOMETER

and

TEST ENVIRONMENT

28 Jan 2013

Learning Objectives

1. **Describe the critical components of the audiology test environment**
2. **Identify the equipment required for audiology testing**
3. **Explain required audiometer calibration and equipment checks**
4. **List infection control procedures**
5. **Troubleshoot temporary and permanent equipment problems**

FOUNDATION

of

Accurate and

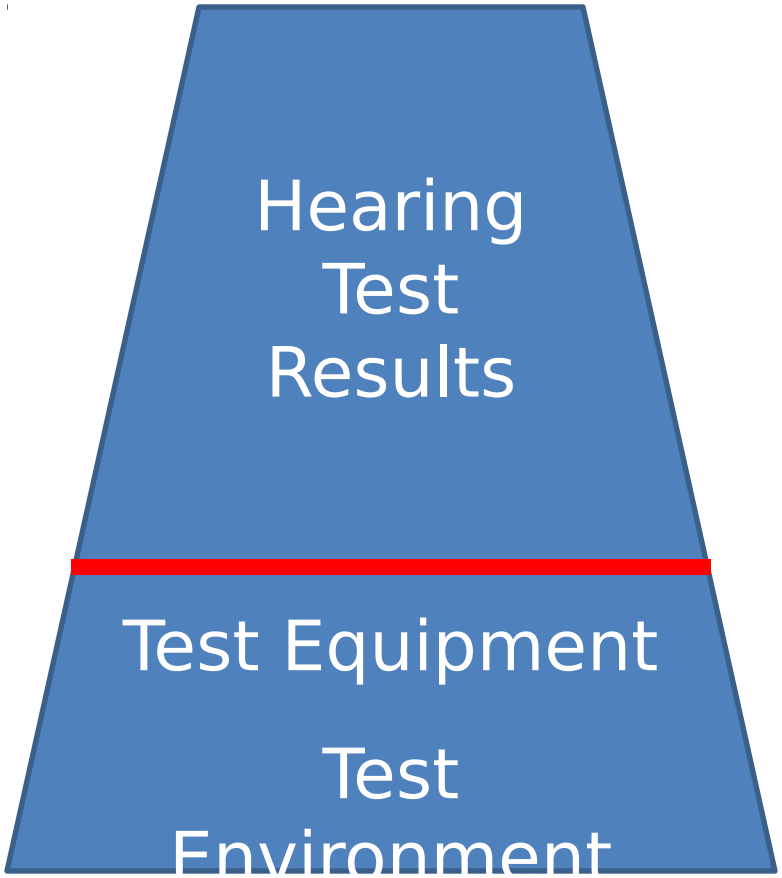
Valid

Hearing Tests

is the

1. Test Environment

2. Test Equipment



Equipment Used for Testing

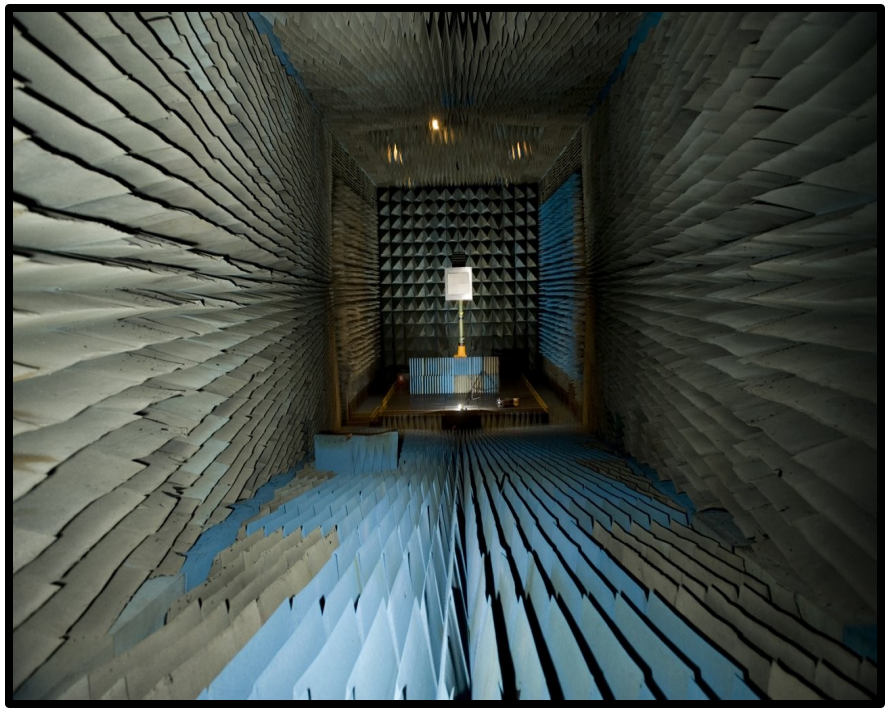
- ✓ **Test booth**
- ✓ **Audiometer**
- ✓ **Computer and data management software – DOEHRS-HC**
- ✓ **Headphones/earphones**
- ✓ **Hand switch or response button**
- ✓ **Artificial (electroacoustic) ear -- “Bio-Joe” --**
  or human listener with normal hearing

Audiometric Sound Booths

Sound Booths

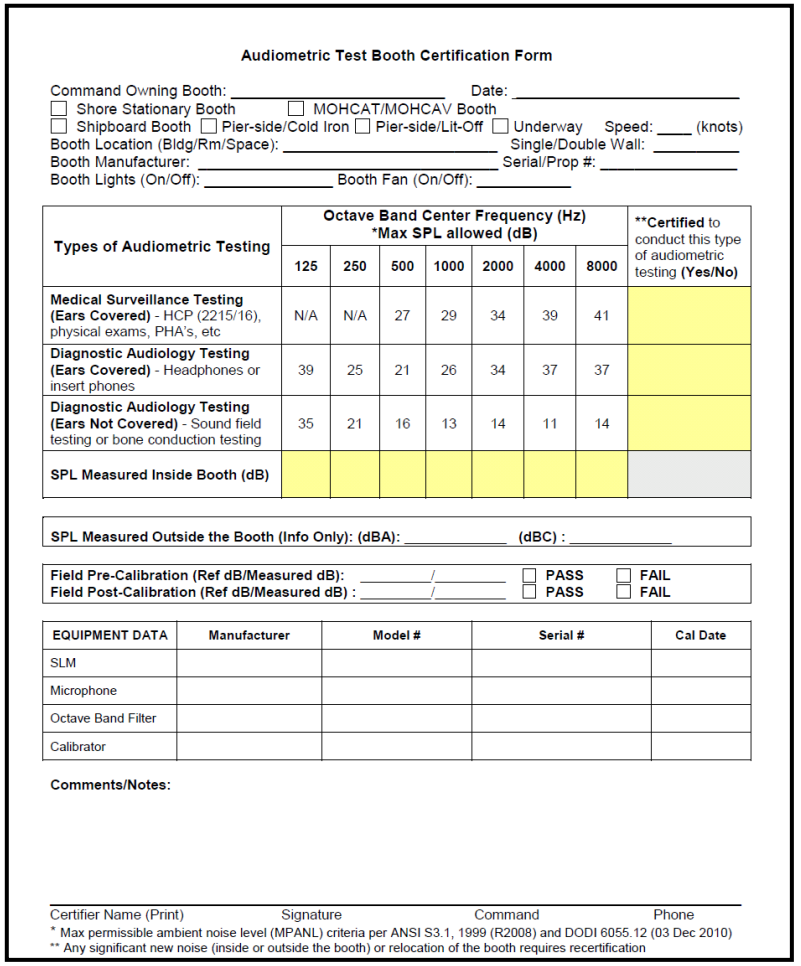
Sound treated

Nearly Sound



Audiometric Booth Certification

- → Required annually
- → Performed by
  - → Industrial Hygienist
  - → or Audiologist
  - → or trained technician
- → Decibel (dB) Levels
  - → inside & outside booth
  - → pierside & underway
- → Displayed clearly



Audiometric Test Booth Certification Form

Command Owning Booth: _____ Date: _____

☐ Shore Stationary Booth ☐ MOHCAT/MOHCAV Booth

☐ Shipboard Booth ☐ Pier-side/Cold Iron ☐ Pier-side/Lit-Off ☐ Underway Speed: ____ (knots)

Booth Location (Bldg/Rm/Space): _____ Single/Double Wall: _____

Booth Manufacturer: _____ Serial/Prop #: _____

Booth Lights (On/Off): _____ Booth Fan (On/Off): _____

Types of Audiometric Testing	Octave Band Center Frequency (Hz) *Max SPL allowed (dB)							**Certified to conduct this type of audiometric testing (Yes/No)
	125	250	500	1000	2000	4000	8000	
Medical Surveillance Testing (Ears Covered) - HCP (2215/16), physical exams, PHA's, etc	N/A	N/A	27	29	34	39	41	
Diagnostic Audiology Testing (Ears Covered) - Headphones or insert phones	39	25	21	26	34	37	37	
Diagnostic Audiology Testing (Ears Not Covered) - Sound field testing or bone conduction testing	35	21	16	13	14	11	14	
SPL Measured Inside Booth (dB)								

SPL Measured Outside the Booth (Info Only): (dBA): _____ **(dBC) :** _____

Field Pre-Calibration (Ref dB/Measured dB): _____/_____ ☐ **PASS** ☐ **FAIL**

Field Post-Calibration (Ref dB/Measured dB) : _____/_____ ☐ **PASS** ☐ **FAIL**

EQUIPMENT DATA	Manufacturer	Model #	Serial #	Cal Date
SLM				
Microphone				
Octave Band Filter				
Calibrator				

Comments/Notes:

Certifier Name (Print) Signature Command Phone

* Max permissible ambient noise level (MPANL) criteria per ANSI S3.1, 1999 (R2008) and DODI 6055.12 (03 Dec 2010)

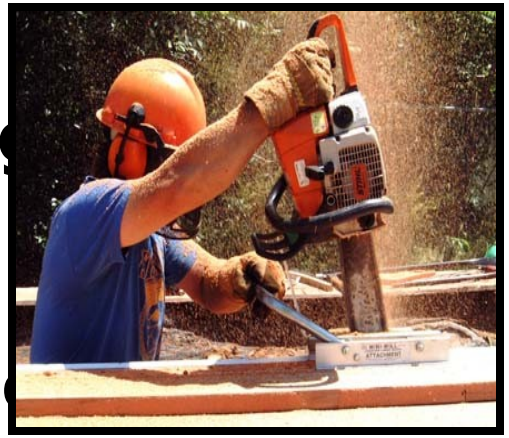
** Any significant new noise (inside or outside the booth) or relocation of the booth requires recertification

Excessive Noise in Booth

Door Seals	• deteriorate
Jack Panels	• leaks
Ventilation	• motor noise • air noise
Activity	• outside noise • technician noise • patient noise

Excessive Noise Solutions

- ✓ **Repair and/or replace equipment**
- ✓ **Patients remove jackets, electronic devices**
- ✓ **OHC Technicians control talkin and noise in test area**
- ✓ **Change testing schedule due t interference from exterior noise**
- ✓ **Relocate test booth**



What is an Audiometer?

- **Electronic instrument**
- **Measures hearing sensitivity**
- **Generates pure tone signals of known frequency a**

Microprocessor Audiometer

Benson Medical Inc CCA-200 mini

Manual Audiometer

GSI 61 Audiometer

Audiometers Used by OHC Technician

MICROPROCESSOR		MANUAL
Software controls testing	⟷	Examiner controls testing
Patient controls stimulus	⟷	Examiner controls stimulus
Tests 1-8 patients	⟷	Tests 1 patient
Automatic STS calculations	⟷	Manual calculations of STS

Continued….

MICROPROCESSOR		MANUAL
Prints forms : 2215, 2216, Non HC, 2217	⟷	Manual audiograms
Data uploaded to central data repository	⟷	Data transcribed into computer database before upload
Semi-manual capability	⟷	Manually operated
Requires maintenance, software upgrades, data backup, calibration	⟷	Requires maintenance and calibration

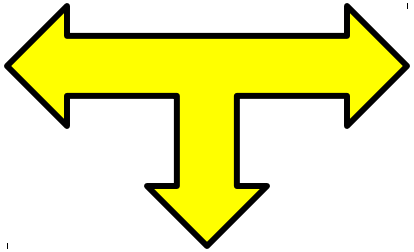
Three Coordinated Systems
Testing - Storing - Collecting

CCA-200

Microprocessor or Audiometer

PERFORMS
hearing test

RETRIEVES
data from DOEHRS-HC



DOEHRS-DR
Data Repository

STORES
demographic & hearing data worldwide

DOEHRS-HC

Hearing Conservation

COLLECTS

demographic and hearing test data

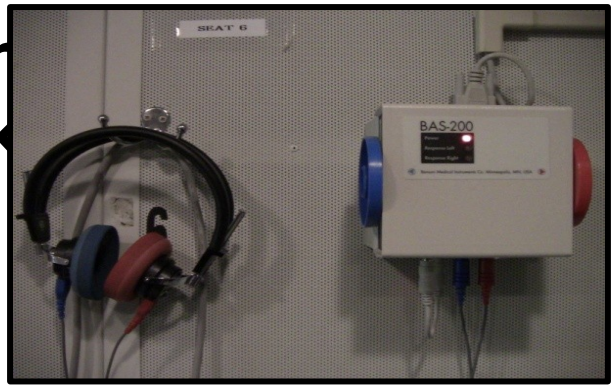
(1-8 patients)

Defense Occupational & Environmental Health Readiness System -- Hearing Conservation or Data Repository

Other System Components

Electroacoustic Simulator (“Bio-Joe”)

- **Verifies calibration status of audiometer**
- **Attached to audiometer for Biological Calibration check**



Headphones or Earphones

- **Calibrated with an audiometer as unit**
- **Swapping headphones changes calibration**
- **Must be repaired together**

Hand switch

Testing Equipment Checks

Electroacoustic Calibration

- **Required annually**
- **Performed by NMCPHC**
- **Verifies all frequency & intensity outputs**
- **Each audiometer has a calibration sticker**
- **Daily Biologic Calibrations (DD2217) established following annual**

Functional Listening Check

Daily hands-on check of hardware

Visually check equipment

- **earphone headband tension**
- **earphone cushions and diaphragms**
- **cords, connections and response button**

Listen to pure tones through headphones

- **frequency and intensity changes**
- **tone quality**
- **crosstalk and static**

Daily Biologic Calibration Check

- **Verifies calibration values of audiometer (Day 2-365) have not changed significantly from (Day 1) baseline**
- **Performed daily before first employee is tested**
- **Bio-Joe should be used as primary calibrator normal hearing listener acceptable; as secondary**
- **Bio-Joe thresholds range from 60 - 80 dBHL**
- **Permitted deviations from initial baseline values**
  - **± 5 dB at 500-4000 Hz**
  - **± 10 dB at 6000 Hz**
- **DD 2217 form established as legal record; maintained for 5 years**

Daily Biologic Calibration Check #2

If audiometer fails calibration

- **check all connections**
- **check placement & condition of earphones**
- **repeat calibration check**

Use alternate listener if problem persists

If audiometer fails calibration with 2nd listener

- **send out for repair (with earphones)**
- **use backup audiometer if available**

Causes for Failed Calibration Check

1. Improper earphone placement
2. Poor connections at jack panel or to audiometer
3. Worn out or flattened earphones
4. Annual electroacoustic calibration expired
5. Malfunctioning artificial ear (Bio-Joe)
6. Malfunctioning audiometer

Audiometer Care and End of Day Procedures

- ✓ **Clean earphones & cords *(if not done in a.m.)***
- ✓ **Hang earphones on hook – NOT on Bio-Joe**
- ✓ **Back up audiometric data on external drive**
- ✓ **Export audiometric data to DOEHRS-DR daily**
- ✓ **Completely shut down system to prevent data corruption *(before CAC removal)***

- ✓ **Store or dispose of employee data**

Infection Control Procedures

Critical Equipment

IF

Objects touch . . .

blood, mucous, ear drainage, cerumen, other bodily fluids

THEN

Clean and sterilize after each use

1. **Probe tips for tympanometry**
2. **Otoscope speculae (non-disposable)**
3. **Ear gauges**

Non-Critical Equipment

Clean and Disinfect

disposable germicidal pre-moistened wipes

hospital grade disinfectant

1. **Headphones**
2. **Headbands**
3. **Response buttons**
4. **Environmental surfaces**

SUMMARY

FOUNDATION

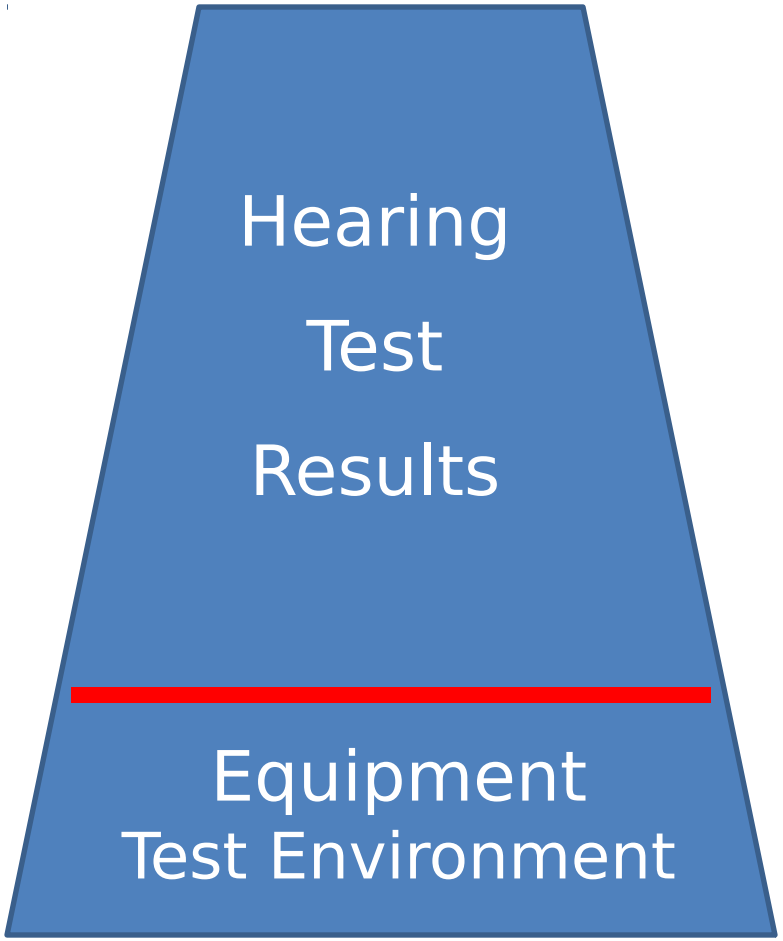
of

Accurate Valid

Hearing Tests

1. Quiet Environment

2. Calibrated Working Equipment



QUESTIONS?